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applied to reflectors) at the principal focus of the great mirror, and work the correcting apparatus from below, entirely dispensing with any platform or tower for the observer. This arrangement would be the most simple and probably the best that could be used; there would be but one reflecting surface, and everything would be symmetrical. To work the apparatus for correcting during exposure by keeping the cross-wires rigidly on the star, to open and close the shutter, and, above all, to exactly focus the plate, seems at first a difficult thing to do by an observer placed, it may be, fifty or sixty feet away; but by means of small electro-motors these things can be easily done. There is of course behind the plate a good deal of space available for the mechanical arrangements, and the details would not offer any difficulty to any one to work out; and as the power would be conducted by thin wires, much less obstruction would be offered by these than by any other merely mechanical arrangement; in fact, the wires that support the apparatus would do for the conductors. With the optical arrangement that would be necessary there would not be any particular difficulty.

The two things that are required are, that the focussing be accurately done, and that the image of the cross-wires and the star should be as plainly seen by the observer on the ground, as if he were observing them with an eyepiece directly. If the power is sufficient, the same apparatus that is used to observe the star and wires will do to focus the plate by simply focussing the star accurately, and then moving the wires previously adjusted to the same plane as the sensitive plate, until they are also in focus.

There are several ways in which this could be done. The simplest would be to fix two right-angled prisms, one on the apparatus behind the cross-wires, where the eyepiece is in the aforesaid arrangement, and one outside the tube in a similar place to the eyepiece in a Newtonian reflector, so that an object-glass of 4 or 6-in. aperture placed at its focal distance from the image of the cross-wires would send the collected rays on, parallel to another object-glass near the lower end of tube, that would bring them to a focus in a convenient place for observation. There are of course other optical arrangements that would do, but this would, I think, be found to answer well.

Ealing: 1884, *Nov.*

A Remarkable Configuration of Stars in the Milky Way detected by Photography. By Rev. T. E. Espin, B.A.

In October last year some experiments were undertaken by me with a view to photographing large fields of stars, and reducing the photographic magnitudes from the plates. By the courtesy of Professor E. C. Pickering I was allowed to see the negatives that he had with him during his visit to Europe. Early in

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October 1883 a camera with a lens of 2½-in. aperture was mounted on an equatorial stand at West Kirby, and several negatives were obtained. Two were exhibited at the November meeting of the Liverpool Astronomical Society, and the council determined to solicit subscriptions for erecting a large equatorial stellar camera. In the mean time Mr. Howard Grubb, taking a kindly interest in the work, generously placed at my disposal a powerful instrument at a nominal cost. This instrument was erected in March at West Kirby. It is an equatorial stellar camera with a compound lens of 4½-in. aperture, and 15·8 in. focal length. The equatorial is driven by clockwork.

The line of research which I proposed to undertake was twofold: (1) The determination of the star magnitudes from the photographs; and (2) the solution of the problem of charting parts of the heavens by photography. The preliminary results of the first part of the research were published last May as *Transactions* No. 3 of the Liverpool Astronomical Society. The second part is more difficult, and till a few weeks ago nothing satisfactory had been accomplished. Some excellent negatives had been obtained, but all attempts at printing from them were failures. The fainter stars in the negatives were not reproduced on the prints. Slow printing and rapid printing were alike useless in this respect, and I had given it up in despair, when the discovery of the remarkable "horseshoe" configuration in *Cygnus* again led me to desire greatly to print from the negatives.

It suddenly struck me that it might be possible to enlarge the images and photograph them; and that then negatives might be obtained which it would be possible to print from. After one or two attempts I was successful, and in printing from the enlargements I found that the faintest detail in the original negative was readily reproduced on the print.

The print that I have the honour to present to the Society* was obtained from an enlargement of a negative taken with the camera on Sept. 20 with one hour's exposure. The plate used was one of Wrattan and Wainwright's "drop-shutter" plates, which I have found to be the most rapid of any obtainable.

The night was remarkably clear, and the exposure from half an hour before to half an hour after meridian passage.

The remarkable configuration of stars photographed on the plate includes five of Argelander's stars.

The number and places of these are as follows, as taken from Argelander:—

D.M. + 46°·3188	XXI.	2	13·6	+ 46	39·5	9·2
D.M. + 46·3191		2	21·2		41·5	7·7
D.M. + 46·3192		2	34·7		43·4	8·7
D.M. + 46·3198		3	27·1		40·2	7·7
D.M. + 46·3201		3	54·2		40·7	7·1

* The print may be seen in the Society's library.—Ed.

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The remaining eleven stars are not in Argelander.

The smallest star photographed is probably not much above the 11th mag. Looking at the field with a 5-inch refractor, many of the stars seemed minute. On the focussing glass of the camera the Milky Way appeared as a bright glow, and this is plainly visible as a bright nebulosity on the print.

A Photometric Comparison of the Light transmitted by certain Refracting and Reflecting Telescopes of Equal Aperture. By Prof. C. Pritchard, D.D., F.R.S.

In a communication to the Society respecting the Oxford observations of stars occulted by the Moon during its recent total eclipse, I had occasion to mention the occultations of four faint stars, three of them approaching the twelfth magnitude, and not included in Dr. Döllen's list, and not found in any catalogue with which I am acquainted. Of these four stars one only was distinctly seen in the De la Rue Reflector of 13-in. aperture, although the other three were sufficiently salient to admit of observation during the eclipse by the Grubb Refractor of 12¼-in. aperture, and of their subsequent identification by means of that instrument.

This circumstance directed my thoughts once more to the long-agitated question concerning the relative light capacities of reflecting and refracting telescopes of approximately equal aperture. There being "nothing new under the Sun," I half expected to find that the question had long since been finally settled, and that there was no need of further research. On inquiring in those quarters where I thought the information, if it existed, would be possessed, and on referring so far as I could to written authorities, I came to the conclusion that the comparisons in question had up to the present time been conducted on insecure bases, and in fact were simply conjectural. Dr. Robinson, the late distinguished astronomer of Armagh, and who, I believe, would be admitted to be among the most reliable authorities on the question, thus writes in the *Monthly Notices* for May 1876:—"William Struve thought that the Dorpat Telescope of 9·6-in. aperture might be compared to Herschel's 20-ft. Reflector of 18-in. aperture;" and he adds, "We are told that M. D'Arrest's Achromatic of 11-in. aperture is very superior to Herschel's 20-ft. Telescope, and almost equal to the great telescope of Lord Rosse." Again, in the *Philosophical Transactions* for 1869 we find the same high authority, in his memoir on the great Melbourne Telescope, writes as follows:—"If we seek any comparison of the light of the two kinds of telescopes, based on actual measures, little is to be found but vague conjectures; thus M. Otto Struve *thinks* that Mr. Lassell's Telescope of 2-ft. aperture is nearly equal to the light of the Pulkowa 16-in." Dr. Robinson, in the *Monthly Notices* already cited, goes on to express